Pricing Novel Goods

FRANCESCO GIOVANNONI, University of Bristol, UK

TOOMAS HINNOSAAR, University of Nottingham, UK

Consider a pharmaceutical company (the seller) contemplating supplying a vaccine for a new disease to a health authority (the buyer). The production cost is uncertain ex-ante and unverifiable ex-post. Both parties prefer an early agreement. But an early agreement where the price of the vaccine depended on the seller's claim of her future cost realization may not be credible as the seller cannot commit not to report a higher cost to get better terms. We investigate the seller's dilemma: agreeing to terms *before* knowing the cost allows an earlier transaction but with the aforementioned commitment problem, while deciding terms *after* learning the cost solves the commitment problem but at the cost of delay.

In our model, a profit-maximizing seller with a single indivisible good and private unverifiable cost ω faces a buyer with a private value θ. The buyer knows the value θ at time 0, while the seller discovers her cost ω at time 1. If a mechanism is agreed at time 0, the transaction occurs at time 1. If agreed upon at time 1, the transaction is postponed to time 2. Waiting is costly, so both seller and buyer value money at time 2 at a fraction $\delta \in (0,1)$ of money at time 1.

If the seller could commit to truthfully reveal her cost, then the optimal mechanism would be a standard take-it-or-leave-it offer of a price schedule $p_0(\omega)$ with the buyer revealing which of these prices he'd be willing to accept. But if the seller cannot commit, she would have an incentive to overstate her costs to achieve the highest price the buyer would be willing to pay. The key issue here is that the seller cannot avoid learning about the buyer's willingness to pay in reaction to her price schedule and cannot commit to not using this information for price manipulation. This is a non-standard limited commitment problem arising from the fact that the designer is an active participant in the mechanism. There are two obvious ways to overcome these issues. The seller can wait until the cost is known and make the optimal offer then. We call this the ex-post optimal (EPO) contract. Alternatively, the seller can offer a fixed price immediately, using her expected cost. We call this the ex-ante fixed-price (EAFP) contract.

We show that *neither* of these contracts is optimal. First, the ex-ante optimal (EAO) contract is an at-will posted price contract. The seller sets a fixed price p and, if this is accepted by the buyer, can choose not to proceed if the cost surpasses p. As p does not depend on the cost, there is no commitment problem. Notably, the EAO contract guarantees a strictly higher profit than the EAFP contract. Secondly, we construct a dynamic mechanism (D) that always strictly dominates the EPO mechanism. The seller offers a menu $(p_0, p_1(s)_{s \in [0,1]})$. In equilibrium, the buyer accepts the first offer if the value is high, and then the good is delivered with certainty at time 1. Buyers with lower value reject p_0, after which the seller offers a price function $p_1(s)$ that is ex-post optimal. Thus, this mechanism captures more surplus for low-value buyers, but with a delivery delay. While the D mechanism always dominates the EPO mechanism, this mechanism is best amongst all of them only when δ is large enough, while EAO is best otherwise.

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